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NEW ORLEANS MEETING—AMERICAN CHEMICAL SOCIETY—II

DIVISION OF FERTILIZER CHEMISTRY

J. E. Breckenridge, *chairman*

F. B. Carpenter, *secretary*

J. E. BRECKENRIDGE: *The Availability of Organic Nitrogen.*

H. C. MOORE: *Results of Some Cooperative Work on Determination of Sulfur in Pyrites. Some Observations on Details of Manipulation, Sources of Error and on Barium Sulfate as Precipitated Under Different Conditions.*

F. R. PEMBER and B. L. HARTWELL: *The Activity and Availability of Insoluble Nitrogen in Fertilizers Determined by Chemical and Vegetation Tests.*

F. W. ZERBAN: *Fertilizers for Field Crops in the South, west of Alabama.* (Lantern.)

B. B. ROSS: *The Determination of Potash in Fertilizers.*

G. S. FRAPS: *Effect of Lime and Limestone upon Acid Phosphate.*

BIOLOGICAL CHEMISTRY DIVISION

Carl L. Alsberg, *chairman*

I. K. Phelps, *secretary*

C. L. ALSBERG: *The Control of Cotton-seed Products.*

There is great economic waste due to deterioration of cotton seed. This deterioration is due to the storage of much of the seed in presence of moisture. This excess of moisture leads first to loss of substance by respiration, then by fermentation and heating. Both respiration and spoilage affect particularly the oil, as they are accompanied by saponification and the formation of unsaturated fatty acids of low molecular weight. Too little attention has also been paid in the traffic in seed to the relative proportion of oil, hull, protein and moisture in the seed. In order that this waste be avoided seed should be dealt in on the basis of content of moisture, oil and hull content. Quality, in other words, should determine its sale. This can only be accomplished by more careful grading, and by purchase on the basis of the grades.

C. C. BASS: *Emetin a Specific Remedy for Alveolodental Pyorrhea.*

Recent investigation has shown that an ameba, *Endameba buccalis*, is present in all lesions of alveolodental pyorrhea. There is abundant evidence indicating that this parasite is the specific cause of the disease. The endamebæ are in the very bottom of the pyorrhea pocket and burrow

to some extent into the diseased tissue in search of certain cells which are the food of the parasite.

Emetin is so antagonistic to amebæ that it destroys most or all the endamebæ in a large percentage of cases, whenever given in the doses in which the present form may be employed—hydrochloride. In a considerable percentage of cases failure is met. The object of this paper is to make the suggestion that some other form of emetin may be prepared which can be used in larger doses, will cause less local irritation where injected, or perhaps may be more amebicidal than the hydrochloride.

CHAS. MANN: *Saw Palmetto, a Biochemical Study.*

The prime object of this investigation was to ascertain the facts relating to the formation of the so-called volatile oil in the fruit. The basis for this part of the investigation was laid by two experiments made by Professor J. U. Lloyd, one made in 1890, and the other started in 1890 but not completed until 1900.

The laboratory experiments have clearly demonstrated that the ethyl esters of the fatty acids, found in the berries both free and as glycerides, are not the product of biochemical processes of the plant, but are products formed after the fruits have been separated from the plant and have been preserved in a peculiar manner. It has also been demonstrated that the enzymes found in the fruit are not necessary to explain the formation of these esters which result by condensation without the intervention of enzyme or other so-called catalytic agent.

Most, if not all, of the other experiments grew out of this central problem. It is hoped that the manuscript will soon be published as one of the bulletins of the University of Wisconsin.

EMERSON R. MILLER and JEMISON MIMS MOSLEY:

Volatile Oils of Some Species of Solidago.

Solidago rugosa Mill. The fresh flowering herb yielded 0.4 per cent. of oil which distilled mainly below 165°. Probably composed chiefly of the dextro- and levo-rotatory forms of α -pinene with smaller amounts of two other terpenes.

Solidago odora Ait. Average yield from the fresh flowering herb, 1.24 per cent. of oil. The chief interest here centers in the methyl chavicol which constitutes about 75 per cent. of the oil. Other constituents are: terpenes, 10–15 per cent.; esters, about 3 per cent. calculated as bornyl acetate; borneol and probably another alcohol, the total free alcohol being about 3 per cent., calculated as borneol; a small amount of volatile fatty acids, at least three; a small amount of non-volatile acid.

EMERSON R. MILLER: *Volatile Oils of Several Species of Eupatorium.*

Eupatorium capillifolium (Lamb.) Small. Of considerable interest owing to its abundance, yield of oil and especially its chief constituent, the dimethyl ether of thymohydroquinone, forming 50 to 60 per cent. of the oil. Other constituents: terpenes (20 to 25 per cent.), consisting of one or more phellandrenes and another terpene, probably *d*- α -pinene; borneol; bornyl acetate, other esters; acetic acid, other volatile fatty acids, probably butyric, valeric and caproic; linalool (?); traces of salicylic acid and an unidentified white solid. Only two other plants known to yield above named ether.

E. Serotinum Michx. yield 0.4 per cent. Physical properties of oil indicate mainly sesquiterpenes.

E. perfoliatum L. Very small yield of a slightly bluish-green oil.

E. hyssopifolium L., *E. purpureum* L., yielded no oil by steam distillation.

Abstract from Bulletin No. 693, University of Wisconsin.

EMERSON R. MILLER: *The Volatile Oil of Achillea Millefolium* L.

Because of its beautiful deep blue color this oil is of interest apart from any practical value it may have.

In addition to the high boiling constituent the oil contains the following: *l*- α -pinene, *d*- α -pinene, *l*-limonene, *l*-borneol, *l*-camphor, cineol, two aldehydes, salicylic acid, acetic acid, two other volatile acids, at least one non-volatile acid, a high boiling compound and a compound of mint-like odor.

The blue constituent was obtained from both the leaves and flower heads, but is contained in very small amount in the former.

Submitted for publication as a University Bulletin, University of Wisconsin.

EMERSON R. MILLER: *Some Volatile Oils from the Genus Pycnanthemum.*

On account of their aromatic qualities this is a very attractive group of plants.

In the order named the yield of oil from the fresh flowering herb of the following species was 0.7–0.8 per cent; 1.2–1.38 per cent.; 0.5–0.7 per cent.

Pycnanthemum Tullis Benth. Constituents: α -pinene, α_D —46.7°, 15–20 per cent.: cineol, 50–60 per cent.; geraniol, linalool (?) together, 15–20 per cent.; salicylic acid; acetic acid and other volatile fatty acids; esters calculated as geranyl acetate, 1–2 per cent. The oil from a form of this

species contained 50–53 per cent. of olefinic terpene alcohols, largely geraniol and 7–8 per cent. of ester calculated as geranyl acetate.

P. incanum (L.) Michx. This oil contained 90–92 per cent. of ketone, consisting largely, if not entirely, of pulegone.

P. lanceolatum Pursh. Constituents: carvacrol, 13–53 per cent.; geraniol, pulegone; probably also pinene and limonene.

Preliminary report.

W. J. V. OSTERHOUT: *Artificial Photosynthesis by Means of Chlorophyll.*

If Schryver's test for formaldehyde is specific, experiments show that formaldehyde produced from chlorophyll acting in presence of carbonic acid in sunlight is due to the decomposition of the chlorophyll and not to photosynthesis, as has been supposed to be proved. Such other pigments as methyl green, iodine green and a variety of other stains, exposed to sunlight under the same conditions as chlorophyll, also give the test for formaldehyde. It seems probable that artificial photosynthesis by means of sunlight has not yet been accomplished.

W. E. TOTTINGHAM: *The Rôle of Chlorine in Plant Nutrition.*

Water cultures of various plants have shown marked stimulating effect of chlorides on root development. Sand cultures of mangel-supplied sodium and chlorine separately and combined have developed most favorably in the latter case. Soil cultures of sugar beet in the greenhouse-supplied sodium chloride have exceeded in yield control, unfertilized cultures. Other cultures receiving sodium nitrate, dicalcium phosphate and potassium chloride have produced greater yields than cultures receiving sodium nitrate, dicalcium phosphate and potassium sulphate. The percentage of sucrose in the dry matter has been increased also where the chlorine was added. Plot experiments in the field with sugar beet under the environment obtaining at Madison, Wis., have produced increased yields due to the application of sodium chloride. The increase in terms of sucrose has reached five hundred pounds per acre in excess of the control plots. It is purposed to extend this investigation to include a variety of plants and more than one cycle of growth and reproduction, in the belief that, with some plants at least, chlorine may be found to function in specific nutrient effects.

G. S. FRAPS: *Nitrification Studies.*

The quantity of nitrates found in 334 soils after 12 weeks is, on an average, related to the total

nitrogen of the soil, but there are decided differences in individual cases. Cropped soils produce less nitric nitrogen than the same soil uncropped. Addition of calcium carbonate diminishes the individual variation, but does not eliminate it.

C. B. LIPMAN: *The Form of Nitrogen in Nitrogenous Materials as an Index to Nitrifiability.*

M. X. SULLIVAN: *The Formation of Creatinine by Bacteria.*

Whatever work has been done on the formation of creatinine by bacteria has been on media containing peptone. Peptone, however, is of animal origin and in itself contains antecedent bodies of creatinine and on slight hydrolysis with acid readily gives creatinine. In the present experiments it was found that a trace of soil added to a protein-free synthetic culture medium, with ammonium sulphate the source of nitrogen led to the development of a strong growth of bacteria. On analysis six months after inoculation of the media with the soil, creatinine was found by color reactions and by the formation of creatinine zinc chloride.

M. X. SULLIVAN: *The Amount of Creatinine in Plants.*

Several years ago the writer found that creatinine, as judged by color reactions and the formation of creatinine zinc chloride, occurred in plants. In the present work the quantity of creatinine was determined by Folin's colorimetric method. The determinations were made on the water-soluble part of the alcohol extract, after treatment with lead acetate, evaporation in vacuo, and taking up in absolute alcohol. Only a few parts per million (1-6) were found in the ungerminated seed of wheat and soy bean. The amount of creatine increased during germination. In wheat seedlings 10 to 12 days old from 40 to 65 parts per million of creatinine were found.

EDWARD GUDEMAN: *Toilet Papers, a Source of Infection.*

ADOLPH BERNHARD: *A Simple Colorimetric Method for the Determination of Free Reducing Sugars and Total Carbohydrate in Miscellaneous Food Products.*

The colorimetric method recently suggested by Lewis and Benedict for the sugar in the blood has been successfully employed, in slightly modified form, for the estimation of free reducing sugars in fruits, milk and a variety of food products. The method has also been utilized for the determination of the total carbohydrate in feces, tissues (glycogen) and in various food stuffs, especially diabetic foods.

For the determination of the free reducing sugars in fruit, a sample of the moist fruit is accurately weighed, ground in a mortar, made up to some convenient volume with water, and then sufficient dry picric acid added to make a saturated solution, precipitate traces of protein, etc. Two c.c. of the filtrate are now heated with 3 c.c. of 20 per cent. sodium carbonate for 10 minutes, diluted to 10 c.c. and compared with a standardized picramic acid solution. The total carbohydrate is similarly determined after hydrolysis and neutralization, the results showing excellent agreement with those obtained by the Allihn method.

JAMES P. ATKINSON: *The Reducing Action of Distillates from Certain Carbohydrates on Distillation with Steam and from Alkaline Solution.*

An alkaline solution, containing glucose, under the conditions imposed in water analysis gave a greenish yellow color in the Nessler reagent, increasing in depth until precipitation of the reagent occurred. S. and S. filter paper No. 589, the purest samples purchasable of saccharose, lactose, grape sugar, levulose, maltose, mannose, dextrin, and soluble starch, similarly treated in water free from ammonia, or in presence of sodium carbonate, gave a yellow color with Nessler reagent, and, finally, in all cases except saccharose, reduced the reagent to metallic mercury. Evidently, the presence of carbohydrate may be confused with the presence of ammonia indicated by the Nessler reagent. In water analysis, in urine and in blood tests this fact should be regarded.

SARA STOWEL GRAVES: *A Precipitant for Ammonia.*

A reagent consisting of 130 c.c. of water, 80 g. of sodium chloride, 100 c.c. cold saturated mercuric chloride and 70 c.c. of cold saturated solution of lithium carbonate, was found as sensitive as Nessler's reagent. With the nephelometer this reagent was found to show ammonia in ammonium sulphate solutions as dilute as 0.00001 per cent. Soluble starch, prepared by boiling 1 g. of starch until clear, then diluting to 100 c.c., held the precipitate in suspension the ten to thirty minutes necessary in nephelometric readings. Tests were made on a standard ammonium sulphate solution, made according to Folin's directions. The solution was found to give satisfactory results with ammonium sulphate alone, with ammonium sulphate in presence of filter paper, with uric acid, and with urine, in water analysis, in normal and micro Kjeldahl determinations. This new reagent for ammonia is as sensitive as Nessler's reagent

and more stable than Nessler's reagent. It will precipitate ammonia quantitatively and will give accurate results nephelometrically.

W. DENIS: *Phenols and Phenol Derivatives in Urine.*

J. H. LONG: *On the Physiological Activity of Combined Hydrochloric Acid.*

This paper discusses the behavior of betain hydrochloride and glutaminic acid hydrochloride, on the one hand, and certain protein compounds of hydrochloric acid, on the other, toward pepsin in digestion. The hydrochlorides of amino acids, and a number of similar bodies, are active in promoting the peptic digestion of proteins in proportion to the ease with which the acid dissociates in aqueous solution. In this respect the behavior of betain hydrochloride is more marked than is that of the glutaminic acid hydrochlorides or the hydrochlorides of other amino acids, although the acid appears to be active in all these bodies.

The hydrochloric acid in combination with protein is much less readily dissociated, and therefore much less active. The amount of acid which may be combined with protein is not sufficient to digest much more than the protein united with it. For real digestion there must be some excess of actual acid, the hydrogen ion concentration of which may be determined. The hydrogen concentration of a number of mixtures of varying degrees of digestive activity is given.

J. H. LONG: *On Combinations of Proteins with Halogen Acids.*

It has been long known that proteins and acids combine in certain proportions, but all the conditions of combination are not so clearly known. The halogen acids and the halogens themselves combine in very different ways. In this paper combinations between casein, fibrin and egg albumin, on the one hand, and hydrochloric, hydrobromic and hydriodic acids, on the other, are discussed. It is shown that the rapidity of combination depends on several factors, as concentration of acid, temperature or agitation of the mixture of protein and acid. Tables are given showing variations with these factors.

The amount of either acid which may be combined with the proteins soon reaches a constant maximum value by elevation of temperature, and is relatively greatest with hydriodic acid. But because of the ready decomposition of this acid it is difficult to distinguish between the union with the acid and the substitution of the element itself. The weights of the acids combined do not seem to

be proportional to the molecular weights of the acids. For each of the acids the amount which may be held by a given protein decreases in the order, egg, fibrin, casein. The reactions with hydrochloric acid are very sharp, and with hydrobromic acid fairly so, but with hydriodic acid the reducing action obscures the other to a marked degree.

CHAS. BASKERVILLE: *On the Rate of Evaporation of Ether from Oils and Its Application in Oil-ether Colonic Anesthesia.*

The rate of evaporation of oil-ether mixtures containing 25, 50 and 75 per cent. of the latter was determined at body temperature. The oils used were olive, peanut, corn, cottonseed, soya bean, codliver and lanolin.

The speed at which the ether evaporated from the 75 per cent. mixture was found clinically to be the best for introducing and maintaining anesthesia in the human by insertion in the colon. The technique is indicated for operations about the head, throat, mouth and the buccal cavity.

Dr. Gwathmey, the senior collaborator, has records of over a thousand cases with different operators without a single case of post-anesthesia pneumonia and with nausea reduced to the minimum.

H. S. GRINDLEY and E. C. ECKSTEIN: *The Free Amid Nitrogen and the Free Amino-acid Nitrogen of Feedingstuffs.*

The free amid nitrogen of tankage, alfalfa hay, and blood meal formed 0.84, 0.63 and 0.16 per cent., respectively, of the total nitrogen of the feedingstuff.

The free amino-acid nitrogen of tankage, alfalfa hay, and blood meal formed 3.08, 2.87, and 0.36 per cent., respectively, of the total nitrogen of the feedingstuff.

The free amid nitrogen and the free amino-acid nitrogen combined accounted for only one seventh to one fourth of the total nitrogenous substances present in the free amid and amino-acid extract of these three feedingstuffs.

H. S. GRINDLEY, W. E. JOSEPH and M. E. SLATER: *The Quantitative Determination of the Amino-acids of the Mixed Proteins of Feedingstuffs.*

The Van Slyke method has been applied to the quantitative estimation of the amino-acids of the mixed proteins of feedingstuffs. While there are marked variations in the amino-acid content of the mixed proteins of feedingstuffs expressed in per cent. of the total nitrogen of the feedingstuff, the variations are not as great, as a rule, as those for the individual proteins. The results show that

the amino-acid content of the mixed proteins expressed in per cent. of the feedingstuff varies quite markedly.

R. S. POTTER and R. S. SNYDER: *Nitrogen Distribution According to the Van Slyke Method in Soils and their Humic Acids.*

R. S. POTTER and R. S. SNYDER: *Amino Acid Nitrogen in Soils Variousely Treated.*

MAX KAHN: *A Study of Urinary Mucin.*

MAX KAHN and F. G. GOODRIDGE: *On Cystine.*

F. G. GOODRIDGE: *Biochemical Studies of Mercaptan.*

MAX KAHN and FRANCIS HUBER: *Metabolism Studies of Multiple Myeloma with Bence-Jones Albumose.*

MAX KAHN and S. SCHNEIDER: *Study of the Mineral Metabolism of Diabetics.*

A. F. HESS and MAX KAHN: *Mineral Metabolism of Two Cases of Hemophilia.*

JACOB ROSENBLOOM: *A Study of the Ethereal Sulfates of the Urine in Various Diseases.*

JACOB ROSENBLOOM: *A Modification of Gerhardt's Test for Diacetic Acid.*

JACOB ROSENBLOOM: *The Influence of Low and High Protein Intake on the Excretion of Acetone, Diacetic Acid, and Beta-oxybutyric Acid in Diabetes.*

WILLIAM MANSFIELD CLARK: *On the So-called "Reaction" of Bacteriological Culture Media.*

By means of titration curves in which the quantity of acid or alkali added to a medium is plotted against the resulting hydrogen ion concentration it is shown that:

I. There can be no true "end point" with phenolphthalein in the titration of culture media.

II. The amount of alkali which must be added in order to reach an arbitrary tint of phenolphthalein is a function of the buffer effect of any particular medium.

III. The so-called correction of the reaction by the addition of a fraction of the amount of alkali required to reach an arbitrary tint of an indicator may result in very different hydrogen ion concentrations in different media.

The practise of titrating media while hot is shown to give no precise data in regard to the reaction of a cold medium.

The fallacies of the titrimetric method of adjusting the reaction of culture media are summed up and it is concluded that the colorimetric method of adjusting to a desired hydrogen ion concentration is more logical.

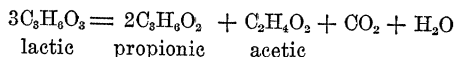
WILLIAM MANSFIELD CLARK: *The Final Hydrogen Ion Concentrations of Cultures of B. Coli.*

The conclusion of Michaelis and Marcora that the fermentation of sugars by *B. coli* is limited by a definite hydrogen ion concentration rather than by the molecular concentration of the acid produced was confirmed in its essentials by studies with seventeen organisms cultivated in thirty different media. There were, however, minor but noteworthy differences in the final hydrogen ion concentrations attained in different media. These differences were related to the magnitude of the "buffer effect" of the different media.

It is pointed out that the determination of the final hydrogen ion concentration furnishes comparable data where the determination of titratable acidity can not.

E. H. WALTERS and WM. M. CLARK: *The Relation between the Propionic Bacteria and Eye Formation in Emmental Cheese.*

A careful study of pure active cultures of *Bacillus propionici* isolated from emmental cheese has shown that the Fitz equation



represents the relation of the end products in a pure fermentation of lactic acid. Experiments are described in detail which show that the carbon dioxide produced in a fermentation of this kind is entirely inadequate to explain the formation of eyes in emmental cheese as proposed by Freudenreich and Jensen since the amount of carbon dioxide produced in cheese is greatly in excess of the amount which could be accounted for in this way.

S. L. JODIDI: *On the Factor to be Used for the Calculation of the Phosphoric Acid in Neumann's Method.*

S. L. JODIDI and E. H. KELLOGG: *On the Factor to be Used for the Calculation of Phosphoric Acid in Neumann's Method. I. The Factor as Influenced by the Water Used for Washing the Yellow Precipitate.*

ROBERT E. SWAIN and E. R. HARDING: *The Quantitative Estimation of Alantoin.*

LEWIS KNUDSON: *The Influence of Certain Sugars on the Growth and Respiration of Vetch.*

An extensive investigation has been made on the direct absorption of various sugars by vetch (*Vicia villosa*). Plants were grown for the most part on agar nutrient media in large cylinders under sterile conditions. The results indicate that vetch is able to absorb and utilize saccharose, glu-

cose, levulose, maltose and lactose. Galactose (Merck's highest purity) is toxic at 2 per cent. and even less. In both 2 per cent. solutions and 0.5 molecular solutions the order of assimilability of the sugars is saccharose, glucose, levulose, maltose and lactose. Sugars increase the growth, increase respiration (evolution of CO_2). Experiments with saccharose indicate also that the roots secrete the enzyme invertase into the culture medium or that reducing sugars are excreted by the roots of plants grown therein. This latter phase is now receiving particular attention.

W. J. ROBBINS: *The Influence of Certain Inorganic Substances on the Digestion of Starch by Penicillium camembertii*.

The growth of *Penicillium camembertii* and the digestion of starch by the same fungus was determined in nutrient solutions which lacked one of the elements usually considered essential for the fungi. The growth of the same fungus and its digestion of starch in the presence of M/1,000, M/10,000 and M/100,000 concentrations of the chlorides, sulphates, nitrates and dihydrogen phosphates of Na and K and the chlorides, sulphates and nitrates of Ca and Mg was determined. It is believed that the results indicate an intimate relation of nitrogen to diastase formation and that the neutral salts in concentrations as weak as M/100,000 affect the secretion of diastase.

WILLIAM MANSFIELD CLARK and HERBERT A. LUBS: *The Differentiation of Bacteria of the Colon-aerogenes Family by Means of Indicators*.

By means of the hydrogen electrode the acid production, in terms of hydrogen ion concentration, of bacteria of the colon-aerogenes family has been followed. The two groups differentiated by Rogers Clark and Davis by the gas ratio were found to differ in their acid production in such a way that under an established set of conditions the final hydrogen ion concentrations could be made to differ widely. The difference in the final hydrogen ion concentration can be made so distinct that it can be easily detected by the proper indicator, either p-nitro phenol or methyl red. The test was shown to correlate perfectly with the gas ratio, and proved to be so simple that it is adapted for routine use.

C. O. JOHNS and ARNO VIEHOEVER: *The Saponins of Chlorogalum pomeridianum and Agave lechiguilla*.

The dried bulb of *Chlorogalum pomeridianum* from California, known as California soap root, gave on extraction and purification a powder,

which by combustion indicated the formula, $\text{C}_{66}\text{H}_{56}\text{O}_{28}$, for this saponin, the molecular weight of which is 1,146. Molecular weight determinations with phenol as solvent gave 1,101 and 1,146. The dried rootstock and underground yellow parts of the leaves of *Agave lechiguilla* from Texas, similarly treated, gave a saponin, the combustion of which indicated the formula, $\text{C}_{35}\text{H}_{42}\text{O}_{14}$, corresponding to the molecular weight 566. The molecular weight with phenol as solvent was 606 and 616. Both saponins gave the saponin reactions. Aqueous solutions of 0.01 per cent. of saponins were lethal in a short period of time for minnows.

C. O. JOHNS and ARNO VIEHOEVER: *On the Alkaloids of Amianthium muscetoxicum (Fly Poison)*.

Leaves and bulbs of *Amianthium Muscetoxicum* were extracted separately from plants gathered in March and from plants gathered in May of last year. More alkaloid was found in the leaves than in the bulbs. More alkaloid was found in the specimens gathered in March than in those gathered in May. Thus far two crystalline alkaloids have been isolated, one crystallizing in needles and melting near 220°C . with effervescence, and the second crystallizing in prisms and melting near 200°C . The physical properties and melting points show that neither of these is zygadine, recently isolated from *Zygadenus intermedius* by Heyl and his collaborators. These alkaloids were soluble in the common organic solvents, but only slightly soluble in water.

DIVISION OF INDUSTRIAL CHEMISTS AND CHEMICAL ENGINEERS

Geo. P. Adamson, *chairman*

S. H. Salisbury, Jr., *secretary*

ALEXANDER SILVERMAN: *The Chemists' Corporation: A Plan to Make Research Possible and Enable the Chemist to Profit by the Results*.

The plan proposed is partly of the nature of a cooperative society, partly a corporation. It is the writer's feeling that chemists who have money to invest shall purchase shares in the corporation; that the funds of the corporation shall be controlled by a committee of capable chemists and business men selected by the various scientific societies; that any chemist submitting plans for research to this committee may have funds advanced to conduct the investigation, providing the committee deems the idea valuable. In case of success the committee may either finance the manufacture or conduct negotiations for the manufacture by a company on such a basis that the chem-

ist shall receive a fair share of the profits. A certain per cent. of the profits shall revert to the corporation and the experimenter shall return all moneys advanced, with interest.

The researches can be conducted at universities or at some of the industrial research laboratories available. Shareholders should receive a fair return on their investment and the balance of profits should be placed in a surplus fund or used to further subsidize research.

The chemist has made many valuable contributions to the industries and has, only too often, been left both without recognition and proper financial return. Industrial research laboratories have bettered his lot considerably, but this plan, with their cooperation and the cooperation of chemists who have already succeeded financially should go a step farther in giving him the recognition he deserves.

WILLIAM M. BOOTH: *The Chemist and Industrial Water Purification.*

W. C. HANNA: *What the Chemist Has Done for the Portland Cement Industry in the United States.*

FREDERIC DANNERETH: *The Industrial Chemist in His Relation to Fire Prevention.*

The total fire loss in the United States and Canada, including forest fires, has averaged 231 million dollars per year for the past five years. Since the beginning of this century we have lost over three billion dollars' worth of property. The per capita fire loss in the United States is \$2.55 as compared with 84 cents in France and 20 cents in Germany. In 1914 the eleven largest fires in chemical industries showed a property loss of $7\frac{1}{2}$ million dollars. As a result of this the industrial chemist has now begun to study the causes of fires in order that he may remove the source, if possible, and he is studying such materials as rubber-lined fire hose so that, after a fire has once started, the fight against it may be conducted more efficiently.

A. LOWENSTEIN and J. J. VOLLERTSEN: *The Influence of Free Fatty Acids on the Flash and Fire Points of Fats and Oils.*

A. LOWENSTEIN and J. J. VOLLERTSEN: *The Influence of Pyridine on the Ammonia Determination of Concentrated Ammoniacal Liquor.*

EDWARD HART: *The Potash Supply.*

Methods unfitted to meet ultimate German competition are those which turn out only potash. This is true because the first cost of the German material is extremely low.

Among processes which are more likely to succeed are:

First, the condensed potash from cement kilns, the obtainable supply of sulphate from this source being placed at not more than 60,000 tons; second, from feldspar refuse, as in the Hart process, where the products are a white pigment containing barium sulfate and gelatinized silica alum and aluminum sulfate. If the alum be unsalable as such it may cheaply be converted into potassium and aluminum sulfates.

G. A. RANKIN: *The Constituents of Portland Cement Clinker.*

From the results obtained during a systematic study of the system $\text{CaO}\cdot\text{Al}_2\text{O}_3\cdot\text{SiO}_2$, we have found that these three oxides *alone* in the proportions in which they occur in commercial portland cement when perfectly burned will produce a clinker made up only of the constituents (compounds) $2\text{CaO}\cdot\text{SiO}_2$, $3\text{CaO}\cdot\text{SiO}_2$ and $3\text{CaO}\cdot\text{Al}_2\text{O}_3$. This clinker possesses all the properties of a desirable portland cement, when it is ground and treated with water.

White commercial portland cement has a CaO , Al_2O_3 , SiO_2 content of over 95 per cent., while the more common gray variety of cement contains over 90 per cent. of these three oxides. Examinations of the clinker of these two types of cement have shown that the main constituents (over 90 per cent.) are $2\text{CaO}\cdot\text{SiO}_2$, $3\text{CaO}\cdot\text{SiO}_2$ and $3\text{CaO}\cdot\text{Al}_2\text{O}_3$, and that the minor constituents (less than 10 per cent.) are $5\text{CaO}\cdot 3\text{Al}_2\text{O}_3$, CaO , and ferrites.

It may, therefore, be definitely stated that portland cement clinker is made up largely of the three CaO , Al_2O_3 , SiO_2 compounds, $2\text{CaO}\cdot\text{SiO}_2$, $3\text{CaO}\cdot\text{SiO}_2$ and $3\text{CaO}\cdot\text{Al}_2\text{O}_3$ and it seems probable that the desirable properties of portland cement are due to presence of these three major constituents and that the minor constituents have little, if any, influence.

GEORGE K. BURGESS and P. D. SALE: *A Study of the Quality of Platinum Ware with Special Reference to Losses on Heating.*

A thermoelectric survey of the purity of 164 platinum utensils has been made and 14 crucibles were subjected to a systematic heating and acid washing treatment to determine losses in weight. Heating losses, which are least for platinum crucibles containing rhodium and increases with iridium content, range from 0.71 to 2.69 mg. per hour per 100 cm^2 at $1,200^\circ\text{C}$. Suggestions are offered as to specifications for platinum ware, and it is shown that losses on heating may be predicted from thermoelectric and microscopic examinations for iron-free crucibles.

J. B. TUTTLE and A. ISAACS: *A Study of Some Recent Methods for the Determination of Total Sulphur in Rubber.*

This investigation was undertaken to learn whether or not the methods recently published for the determination of sulphur in rubber were any improvement over the Waters and Tuttle method, the one now in use at the Bureau of Standards.

The methods compared were divided into two classes, viz., those for the determination of the total sulphur and those for the determination of sulphur other than that present in the insoluble sulphates. It was found that the methods of the second class could not be relied upon to give accurate results. The Waters and Tuttle method was found to give satisfactory results, and is recommended for general use.

The free sulphur was found to be the most troublesome factor, and a new method is given which eliminates this difficulty.

E. R. WEAVER and J. D. EDWARDS: *Gas-washing Apparatus with Enclosed Filter.*

Three forms of gas-washing apparatus are described, which give thorough circulation of the liquid, efficient washing and which operate under low inlet gas pressure. If a precipitate is formed it may be filtered off and washed without coming in contact with the air.

E. R. WEAVER: *A Simple Stone-frame Chemical Hood.*

Two chemical hoods are described, one with and one without doors. The hoods are light, simple, resistant to chemical action, and easily cleaned and ventilated.

E. R. WEAVER and J. D. EDWARDS: *Apparatus for Determination of Sulphur in Gas.*

A simple apparatus for determining sulphur in gas is described. The gas is burned in a straight glass tube, from which the products of combustion are drawn through a suitable absorbent. The burner consists of a porcelain tube, the gas being ignited at the tip, by a spark between platinum terminals sealed to the burner tube. The air necessary for combustion is regulated by suitably placed cocks on the inlet tubes.

E. W. BOUGHTON: *The Determination of Oil and Resin in Varnish.*

The proposed method includes saponification of the varnish, separation of unsaponifiable matter, and separation of fatty acids from resin acids by the Twitchell or Wolff methods of esterification. A correction is applied for resinous matter that is weighed as fatty acids. Oil and resin can not be

separated by treating varnish or oxidized varnish with solvents such as petroleic ether or chloroform. Resinous matter is only partially precipitated by petroleic ether. Determination of glycerol yield and calculation of oil content therefrom is not satisfactory. Proposed method gives results for resin content which are within 5 per cent. of the amounts present.

W. O. MITSCHERLING: *Tetraphosphorus Trisulfide.*

H. A. HUSTON: *The German Potash Industry.*

The potash industry includes about 200 operating mines and about 50 in course of construction. Only the more favorable locations have been developed. Enormous deposits below the 5,000-foot level are untouched and the whole polyhalit region which contains nearly as much soluble potash as the carnallit region, and is reached by the existing shafts, is not worked at all for potash.

The United States use about one fourth of the total production of the potash mines, being the main consumers of concentrated salts. The total amount of material mined annually is about 11,000,000 tons. The United States use 280,000 tons of actual potash contained in about 1,250,000 tons of the various products which we purchase. Of this about 95 per cent. is used in agriculture and five per cent. in chemical industries other than fertilizer factories. The potash used in American agriculture increased 277 per cent. from 1900 to 1910. That used in chemical industries increased about 20 per cent. Potash used in the chemical industries in the United States for the years 1911, 1912 and 1913 averaged 38 per cent. more than that used in 1910.

The war has caused a great increase in the cost of producing potash because of advances in cost of labor, fuel and explosives. Freight to the ports used was much higher than to the usual ports. The \$4 per ton increase in price delivered at American ports by no means covers the additional cost previous to putting on shipboard. The increase in ocean freight is always at the expense of the seller, never at the expense of the American buyer. The buyer pays for special war insurance if he elects to use it. Any increase in price in excess of \$5 per ton represents profit to the American potash importers.

Potash stocks in the American warehouses of the German Kali Works at the outbreak of the war were turned over to American buyers at regular list prices.

(To be continued)

CHARLES L. PARSONS,
Secretary